ISCHEMIC MEDULLAR DISTURBANCES IN OSTEOPOROTIC SPONDYLOPATHY INDUCED BY SEXUAL HORMONES DEFICIENCY

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ABSTRACT

Osteoporotic spondilopathy (OS) mainly develop in women (7:1), usually in the post climacteric period. The pathogenetic background of the OS is the hormonal deficiency, especially estrogens. OS may be divided as primary (affection of the gonads) and secondary (affection of other endocrine glands).

There were studied 32 patients within the age group of 36-72 years with spondylotic medullar ischemic disturbances. The general clinical manifestations of OS are as follows: adiposity, hirsutism, cramps, reduction of height, gibus, horizontal abdominal fold, memory disturbances. The spinal ischemic pathology develops usually in the region of the thoracic – lombar spondiles at the IIIrd stage of vertebral dystrophy with biconcave, tamping spondiles, channel stenosis, ossification of the ligaments and meninges. These modifications compress radiculo-medullar arteries, producing ischemic foci, that can develop as acute forms (spinal stroke type) and slowly progressive (ischemic myelopathy). The acute forms (14 patients) manifest with flaccid para- and tetraplegy, sensory sublesional and sphincter disturbances, Chronic forms (18 patients) develop slowly progressive starting from an intermittent medullar claudication with later establishing of spastic, spastic-atrophic and amyotrophic para- and tetraparesis in relation to the localization and intensity of the ischemic foci. An important role in the pathogenesis of the ischemic medullar disturbances plays the compression factor of the medullar arteries by the dystrophic modifications of the spondiles, petrifaction of the meninges, early atherosclerosis, determined by impaired lipid, protein, mineral metabolism within the deficiency of the sexual hormones.

Decisive roles in the establishment of the diagnosis of OS play anamnesis, investigation of the hormones and metabolism, imagery diagnosis of the vertebral column. The treatment is directed to activate the function of the gonads and substitution feminine sexual hormones in small doses, prevention and treatment of vascular ischemic disturbances.

Key words: osteoporotic spondilopathy, ischemic medullar disturbances, myelopathy, sexual hormones deficiency

INTRODUCTION

Osteoporotic spondylopathy, induced by sexual hormones deficiency, represents a complex of clinical symptoms, biochemical and radiological signs determined by the deficit of sexual hormones due to different endogenous and exogenous factors that diminish the function of the gonads, even before menopauses (1,2,10). Early detection and treatment of the hormonal deficit may prevent different complications both at the bone and nervous system levels (6).

Spondylotic osteoporosis occupies the 4th place among the most frequent diseases leading to disability (8), after cardiovascular disorders, diabetes mellitus and oncological disorders.

The number of patients is rising in relation to increasing of the life expectancy, especially in women in comparison with men (7:1). Each 4th woman older than 50 years has a compression of a vertebra, but in 15% cases the affection is asymptomatic and is not diagnosed (7,9).

The diagnosis of osteoporosis is an actual problem in the European countries because the population

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experiences lack of elementary information about the problem. The experience of the developed countries shows that information about the problem and its prophylaxis are the main strategies to fight against the disease. In USA due to the informative campaign the knowledge about this condition raised from 15 to 85%, which allow promoting prophylactic measures.

The vascular medullar and cerebral complications are influenced by the disturbance of lipid, protein and mineral metabolism, provoked by the insufficiency of the sexual hormones.

From the clinical point of view osteoporosis is studied mainly as a problem of pain and fractures (3-5) and little attention is paid to the neurological complications which are rather more frequent and severe than it is considered.

MATERIALS AND METHODS

There were studied a group of 32 women with ages between 36 and 72 years, all of them being in the peri- or postmenopausal period. The neurological examination revealed signs of acute ischemic medullar disturbances and spondylotic myelopathy. The diagnosis was established based on the clinical, radiological and clinical-pathological examination in 5 cases.

DISCUSSIONS

Hipercolesterinemia, hiperlipidemia, hipoproteinema and mineral dysmetabolism play an important role in the pathogenesis of the neurological syndromes, developed as the result of insufficiency of the sexual hormones (table 1). Initially autonomic-vascular dystonia is manifested, initiating a pseudoneurastenic syndrome. Gradually progresses medullar and cerebral atherosclerosis, causing diverse syndromes.

General clinical manifestations of osteoporotic spondylopathy: viscous character of the face and limbs, adiposity, hirsutism, cramps (in the leg muscles), constipations, metheorism, diarrhea, presence of a horizontal fold in the abdominal region, memory disturbances, height reduction by 2-3 cm, kiphosis (fig. 1). Regarding the table 2 we mention that the autonomic-vascular and radicular syndromes are early manifestations of the hormonal spondilopathy induced by sexual hormones insufficiency and the ischemic medullar myelopathy occurs at a later age.

ISCHEMIC MEDULLAR DISBRANCHES

Ischemic medullar stroke

The ischemic medullar pathology develops mainly at the thoracic-lumbar level, in the IIIrd

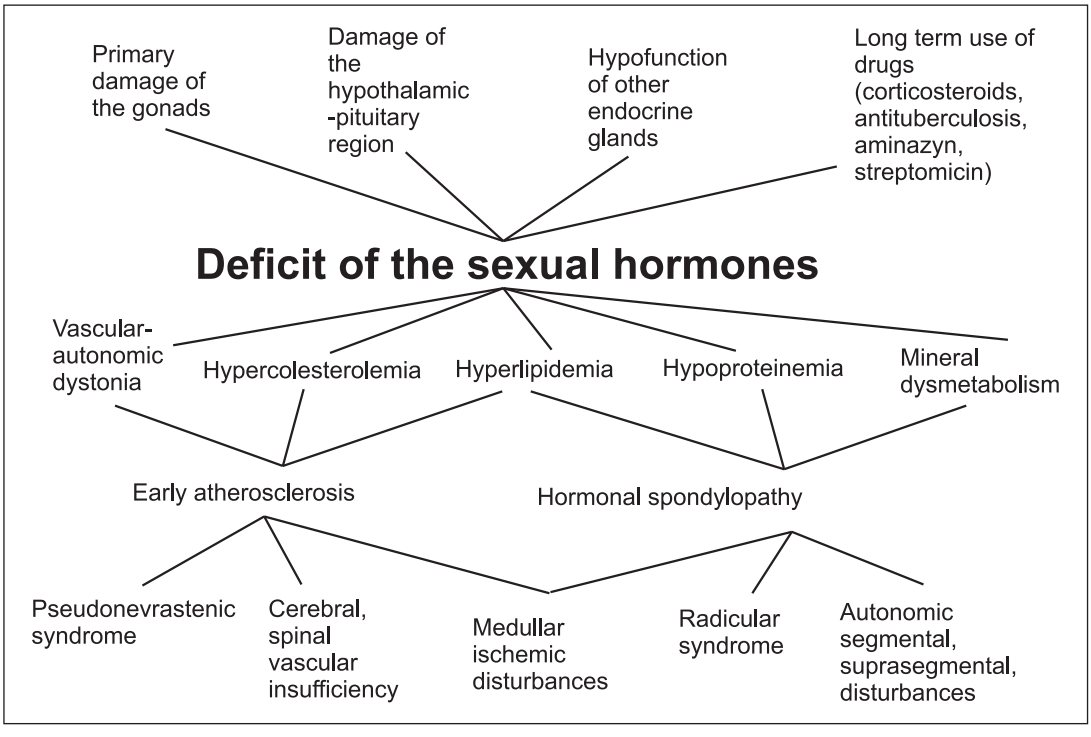

Table 1. *Etiopathogenic mechanism of development of hormonal spondilopathy and neurological complications*

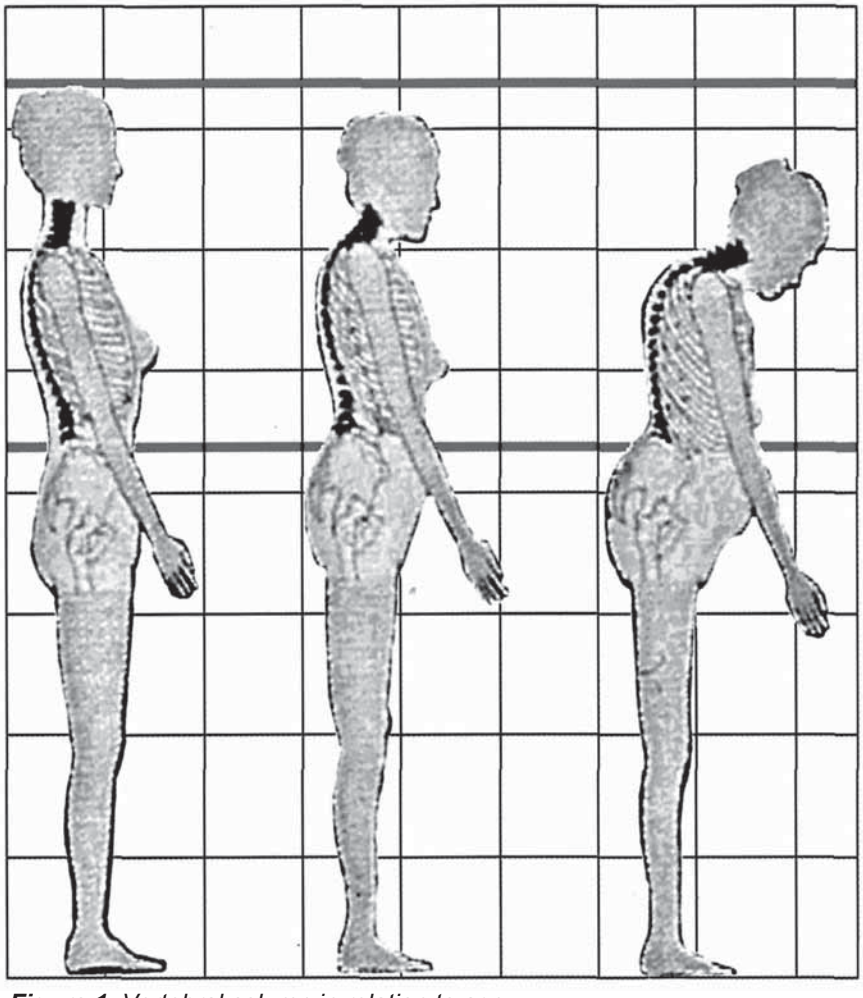

Figure 1. *Vertebral column in relation to age*

Table 2. *Neurological complications in dyshormonal spondylopathy*

Neurological complications	Clinical peculiarities
Autonomic segmental and suprasegmental syndrome	Occurs at the juvenile age with peculiarities. The history reveals later onset of the menstrual cycle, limited eliminations
Radicular syndromes	More frequently the roots T12, L1, L2 are affected, caused by deformities of the vertebras with sharp margins, sometimes leading to a violent pain
Vascular ischemic myelopathy	Gradually mainly the thoracic level is affected with a spastic paraparesis, mild sensory disturbances
Ischemic spinal infarct	Acute onset at the cervical or thoracic level with flaccid tetra- or paraparesis, sphincter and sensory disturbances
Dyscirculatory encephalomielopathy	Develop at advanced ages, mainly in the vertebrobasilar system with dementia and bilateral pyramidal insufficiency

stage of vertebral dystrophy: biconcave vertebra, channel stenosis, ossification of the ligaments and meanings. These changes compress the radiculo-medullar arteries, leading to ischemic foci, that later can develop in acute form (medullar stroke type) or slowly progressive (ischemic myelopathy).

The acute forms (14 patients) manifest with flaccid para- or tetraplegia, sublezional sensory and sphincter disturbances. The ischemic focus more frequently (in 9 cases) was localized in the critical centromedullar zone (Fig. 2C) and in the zone of a. spinalis anterior blood supply (in 5 cases).

Based on the clinical-pathological material there were established the following critical zones (Fig. 2).

The examination of the CSF plays a very important place in the diagnosis of the acute medullar stroke. There are no changes in the CSF the first 5 days and only after the 5th day a relative protein-cellular dissociation develops. It is increased the

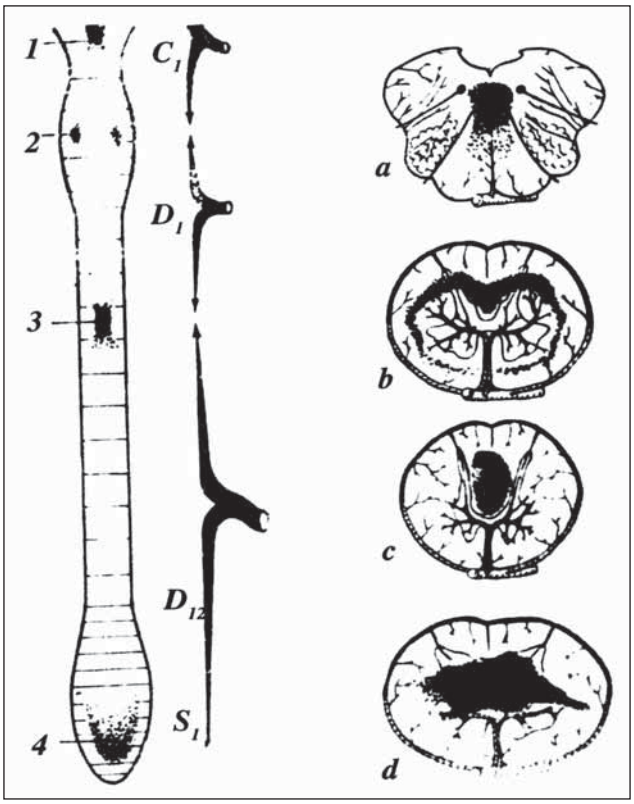

Figure 2. *"Critic" ischemic medullar zones: 1a) Bulbar – terminal zone of the anterior spinal artery; 2b) Intramedullar C3-C4 borderline zone between vasa corona and anterior spinal artery; 3c) Centromedullar Th4 – borderline zone between the superior basin of the vertebral artery and inferior aortal basin, 4d) – Terminal – at the level of conus medullaris S3-S5.*

concentration of the proteins and as well appear modified erythrocytes, neutrophiles, lymphocytes that correspond to the blood formula. These changes are caused by microhemorrhages in the area of medullar infarct and decomposition of the ischemic tissue.

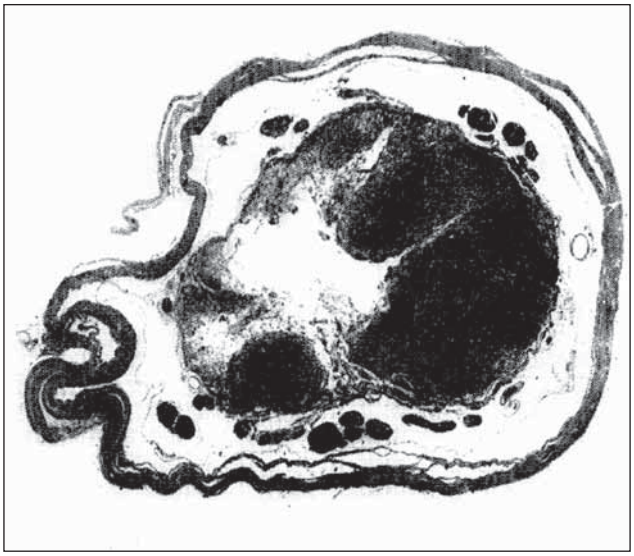

Figure 3. *The spinal cord at the ThX level. Ischemic stroke. Medullar edema. Hematoxylin-eosin staining*

Ischemic dyscirculatory myelopathy

Chronic forms (18 patients) have a lent progressive onset, initially with an intermittent medullar claudication, but in relation with the localization and intensity of the ischemic foci may develop to a myelopathy with spastic, spastic-atrophic or amyotrophic tetra- or paraparesis.

Several stages can be distinguished in the development of the dyscirculatory myelopathy:

Medullar intermittent claudication manifests with a weakness in the lower limbs which appear after a load of 200-300 steps. The patients have to take a rest in order to be able to continue walking.

Compensate dyscirculatory myelopathy is manifested by tetra- or paraparesis with or without sensory and sphincter disturbances, which can progress to the decompensate stage, which is characterized by the development of a lent progressive medullar infarction with cavity formation.

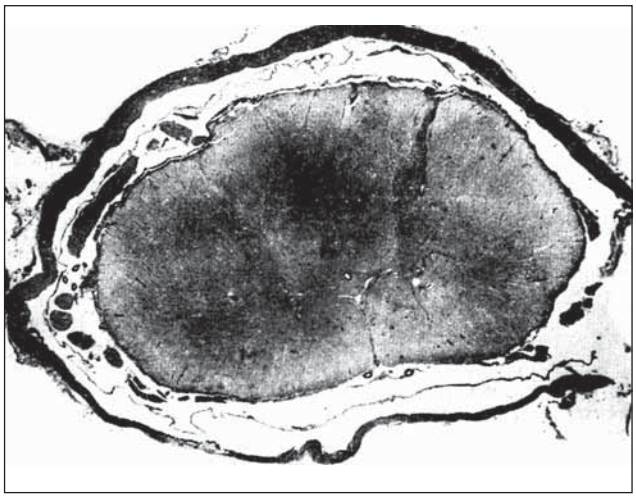

Figure 4. *Spinal cord at the Th1 level. Disappearance of the picture of the medullar gray matter, multiple lacunas.*

At the cervical level 3 forms could be distinguished:

Spastic form with spastic tetraparesis, the ischemic foci is localized in the "intramedullar critical zone" (Fig. 5a); spastic-atrophic form with atrophies in upper limb and spastic paraparesis in lower limb, the ischemic focus is localized in the zone of vascularization of the anterior spinal artery (Fig. 5b); atrophic form with atrophies in the upper limbs, the ischemic focus is localized in the zone of

anterior spinal artery supply, limited by the anterior horn (Fig. 5c).

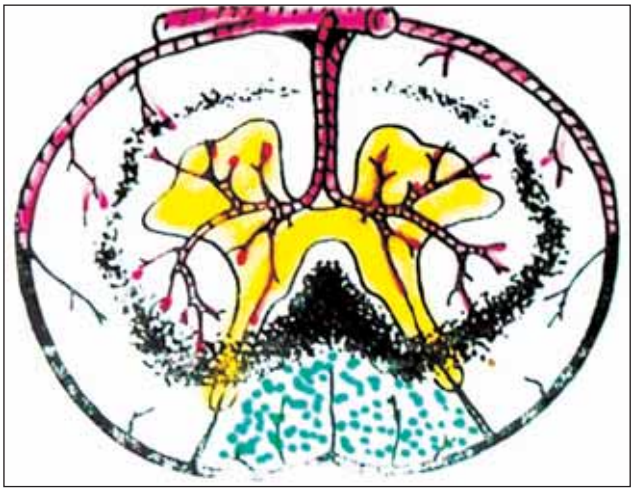

Figure 5a. *Ischemic foci is localized in the "intramedullar critical zone".*

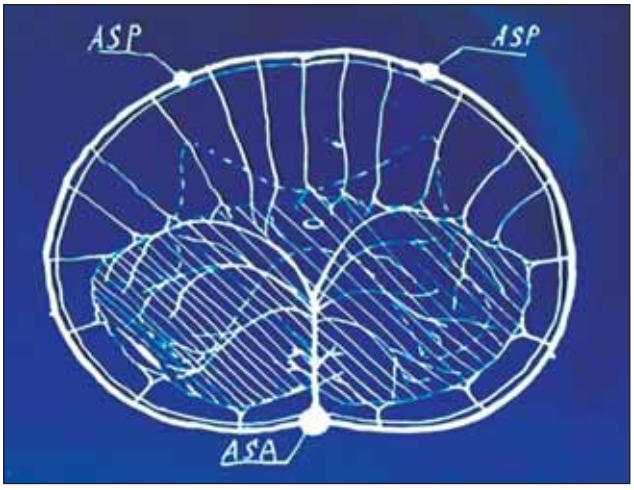

Figure 5b. *Ischemic focus localized in the zone of vascularization of the anterior spinal artery.*

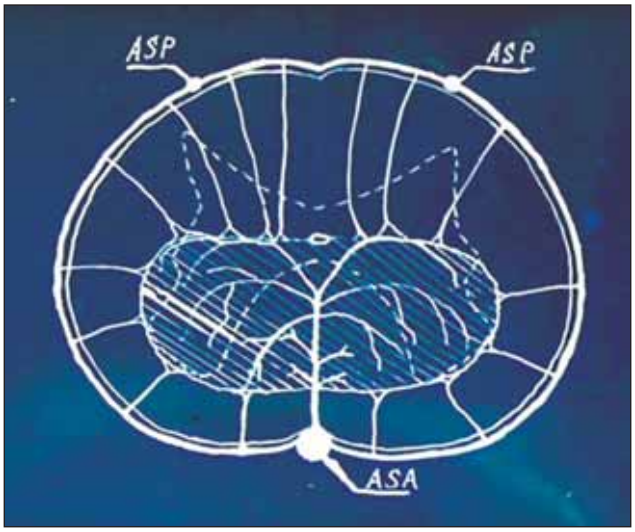

Figure 5c. *The ischemic focus is localized in the zone of anterior spinal artery supply, limited by the anterior horn.*

The ischemic focus at the thoracic level is manifested with a spastic paraparesis. At the lombosacral level initially develops a spastic-atrophic paraparesis which later on evaluate into a flaccid paraparesis with sphincter disturbances.

The compressive factor of the medullar arteries by the dystrophic vertebral changes, calcinations of the meanings and early atherosclerosis plays an important role in the pathogenesis of medullar ischemic disturbances (Fig. 6). Atherosclerosis develops due to disturbed lipid, protein, mineral metabolism within the lack of sexual hormones.

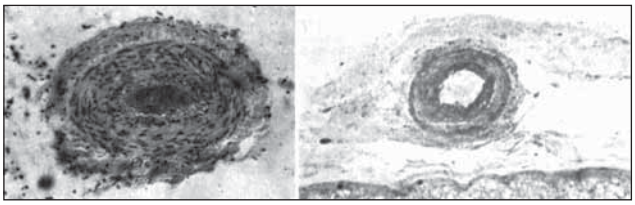

Figure 6. *Extramedullary arteries with hiperplazia of the vascular walls and narrowing of the lumen.*

We can distinguish 3 radiological stages of the sexual osteoporotic spondilopathy (Fig 7).

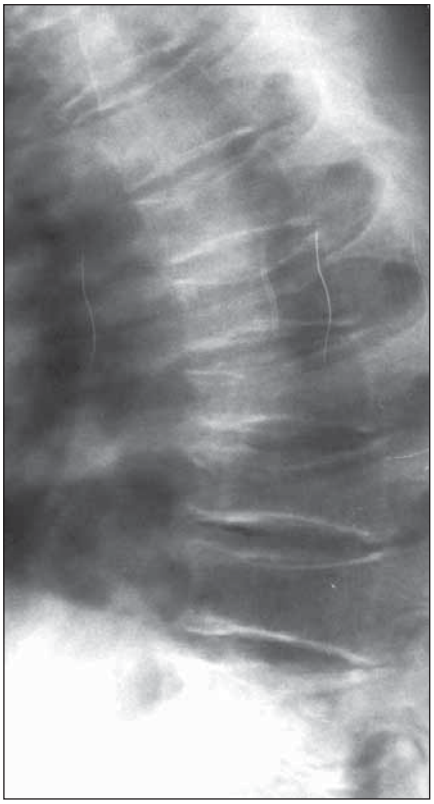

Figure 7a. *Stage I. The image visualizes a generalized manifested osteoporosis of the spondiles, which appear reduced in the vertical size, mainly on the anterior part, leading to a chifosis. The margins of the vertebral bodies are well delimited. There is an impression that the image is without enough contrast effect.*

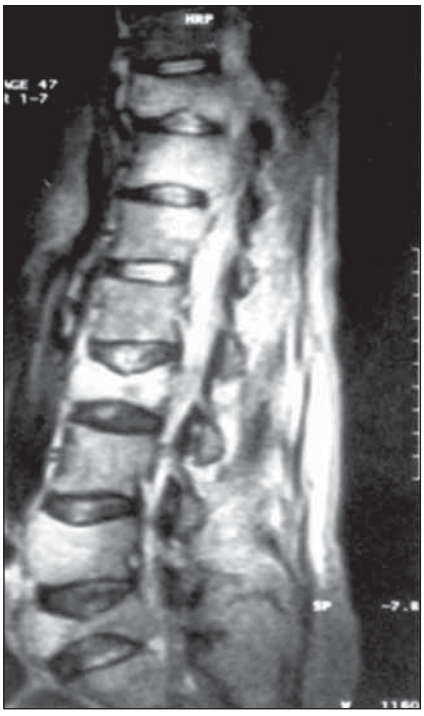

Figure 7b. *Stage II. On the background of a generalized osteoporosis organic modifications of the vertebral bodies appear. The vertebral bodies lose their forms, with biconcave plateaus, becoming as "fish vertebras" and biconvex intervertebral spaces. Such types of vertebras occur mainly at the lower thoracic, upper lumbar levels, being observed such changes successive over 1-2 normal vertebras.*

Figure 7c. *Stage III. Biconcave vertebras. Compressive fracture of the Th11 vertebra. Fractures of the vertebral bodies and other bones after minor traumas.*

The treatment is performed in two directions. In young and preclimacteric persons the treatment is directed to activate the function of the sexual glands (vitamins A and E, gonadotropin, activation of microcirculation, Ca etc.). Medications that substitute female sexual hormones in low doses are indicated to persons of postclimacteric ages. Antiosteoporotic drugs (Bonviva, Aflutop, Teraflex etc.) and complex drugs which contain vitamins and minerals, derivates of the nicotinic acid to improve microcirculation, diet rich in vitamins and minerals are administrated.

CONCLUSIONS

There were studied 32 female patients from 36 to 72 years old by means of clinical and paraclinical methods, all of them being within the peri- and postmenopausal periods who developed vascularmedullar disturbances. Due to dystrophic-degenerative changes of vertebral columns acute and lent progressive (discirculatory myelopathy) established.

The acute forms manifest with flaccid para- and tetraparesis, sphincter and sublesional sensory disturbances. The lent progressive forms have a gradual onset, initially as intermittent medullar claudication, which transform into a spastic, spastic- atrophic or atrophic form in relation to the localization of the foci and intensity of the ischemic process. An important role in the pathogenesis of the medullar ischemic disturbances plays the compressive factor due to the stenosis of the vertebral channel, dystrophic-degenerative modifications of the vertebral column and eraly aterosclerosis suggested by the disturbances of the lipid, protein, mineral metabolism, influenced by the insufficiency of the sexual hormones.

In the preclimacteric period the treatment was directed to the activation of the function of the sexual glands. In women of post climacteric period treatment with substitution of sexual hormones was applied, mainly estrogens and antiosteoporotic treatment.

Elaboration of special health programs of spinal column osteoporosis its complications prevention and could be of great importance.

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